Grantee: Alaska Division of Forestry
Project Name: Biomass Reforestation for Boreal Forests

Grant #7310003 EETF Grant, Project #413002

Grant Completion Report

Background:

The Alaska Division of Forestry and the Forest Products Program at UAF investigated a low cost planting technique intended for forest regeneration after biomass harvest that uses un-rooted poplar tree stem-cuttings. The technique involved the wintertime collection of branch cuttings that were stored, soaked, and then planted as stems after snowmelt. Stooling beds were also planted to facilitate future stem harvests of poplar varieties that were found to thrive over the course of the project. Although less energy-dense than other biomass fuel stocks, poplars have much faster growth rates. This study compared the growth and survival of hybrid poplar varieties to that of the native balsam poplar found in Alaska. Several different hybrids were planted in 2013 with varying success. In 2014, only one hybrid poplar clone, Northwest, which is a hybrid of balsam poplar (*Populus balsamifera*) and *P. deltoids*, was evaluated.

Activities:

In March 2013, the project team harvested over 4,000 cuttings of poplar (*P. trichocarpa*) growing in Palmer and balsam poplar (*P. balsamifera*) from Delta Junction; poplar whips were obtained from Canada (*P. balsamifera* L. from near Edmonton, Alberta; and "Northwest" hybrid poplar *Populus x jackii* Sarg. from near Edmonton, Alberta). Both the cuttings and whips underwent a 5-7 day pre-soak treatment in advance of planting in the late spring at 10 previously logged upland sites in the Matanuska-Susitna Valley (5) and near Delta (5), as well as two UAF sites. Survival and height was assessed after two growing seasons.

Project Costs:

Denali Commission:	$ 20,697.81
Alaska Division of Forestry:	$ 24,297.41
Alaska Division of Forestry Cash match:	$ 45,000.00
Alaska Division of Forestry excess match:	$ 10,632.11
Total Project Expenditures	$ 100,627.33

Project Outcomes:

Significant differences in survival and height were found, with *Populus x jackii* having the highest survival, followed by the Alberta *P. balsamifera* L. *P. balsamifera* L. from Delta Junction had lowest survival and height growth.

The overall survival at the end of the second growing season was 47%. The Northwest hybrid poplar had the highest survival (69%) followed by balsam poplar from Alberta (56%). Comparing interior Alaska vs. Southcentral Alaska planting sites, the ranking of varieties was

the same for planting regions. Poplar from interior Alaska had lowest survival (31%) and height (7.2 in), for both interior Alaska and Southcentral Alaska planting sites.

Differences in height at the end of the second growing season were less clear. Only the Delta Junction variety was significantly different. The 2 varieties from Alberta had the highest rank in height. Although height growth did yield significant differences among varieties, height growth at 2 years did not provide insights into forest establishment or future forest growth. In general, larger diameter cuttings appeared to have greater height growth. Both height growth and survival appeared to be reduced when competing vegetation was heavy.

Problems Encountered:

Abnormally hot and dry conditions during the summer of 2013 resulted in a very high mortality rate of the planted cuttings. However, cuttings at the wettest site fared significantly better, and the project team noted higher survival rates among hybrid species. A replanting of four poplar varieties in 2014 resulted in significantly higher survival rates, especially among certain hybrid species. In May 2015, additional varieties were planted for future evaluation of their viability in Alaska as an easily renewable source of biomass fuel.

Conclusions and Recommendations:

Climate models suggest that climate regimes have shifted about 10-20 degrees in latitude. The best-performing genotypes overall in this study were those collected from 5-10° latitude south of Fairbanks, while the more northerly poplar sources had the poorest survival. Focusing on more southerly clones may be considered in the future as climate change progresses. However, while the hybrids used in this study grew better than the local variety, there was a difference with phenology (budset and senescence) and photoperiod. The light regime in Alaska is very different than lower latitudes. The hybrids that got hit by the early frost did not harden off as early as the Alaskan variety and thus retained their leaves when the frost hit.

The performance of the “Northwest” hybrid poplar is noteworthy. In previous trials, hybrid poplars from elsewhere in North American did not survive in Alaska. “Northwest” hybrid poplar reportedly contains *P. balsamifera* parentage, which may provide greater cold tolerance. Results of this study suggest that “Northwest” hybrid poplar deserves further study across Alaska, particular with projected climate change. In May 2015, additional varieties were planted to evaluate their viability in Alaska as an easily renewable source of biomass fuel.